



Fujitsu's vision for High Performance Computing

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Motoi Okuda**

**Computational Science and Engineering Center
Fujitsu Ltd.**

**Peta Scale Computing Research Center
Fujitsu Laboratories Ltd.**

Agenda

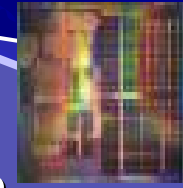
- Fujitsu's HPC Solutions
 - Current Fujitsu's HPC
 - New HPC Server PRIMEQUEST/HPC
 - Software environment for HPC
- Towards Peta Scale Computing

Concept of Fujitsu's HPC Solutions

FUJITSU provides HPC Solutions based on leading-edge CPU & System technology, Cluster Technology and Grid Technology

CPU & System Technology

- High-end Scalar CPU and System Chip
- High Performance & High Reliable System
- HPC Software Environment Including Optimized Compiler



Fujitsu's HPC Solution

Cluster Technology

- Interconnect
- Cluster Management Software
- Fast Network File System

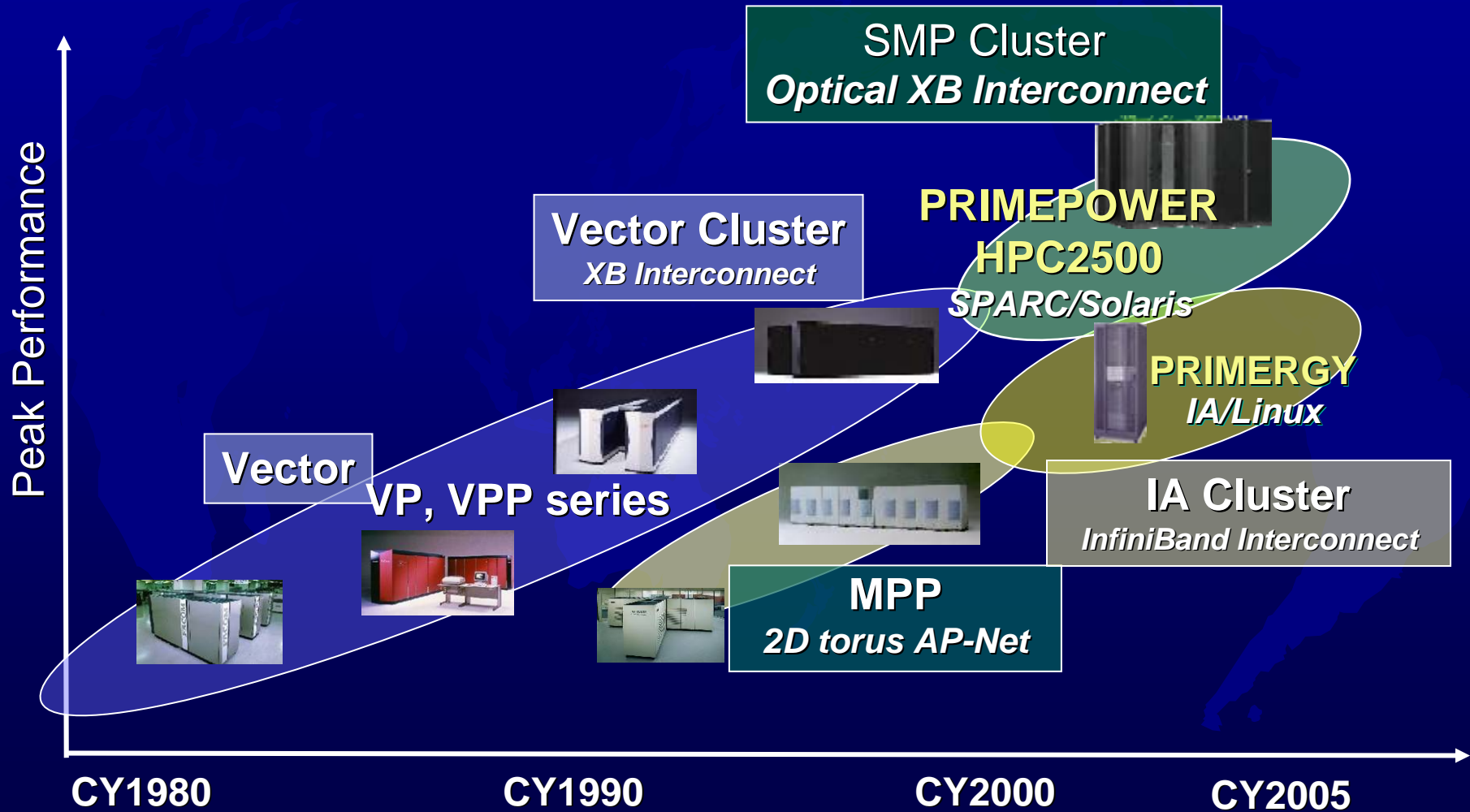


Grid Technology

- Grid Middleware
- Grid Solutions

History of Fujitsu HPC Product

- From Vector to Scalar SMP Cluster and IA Cluster
- Based on CPU, System and Interconnect technology

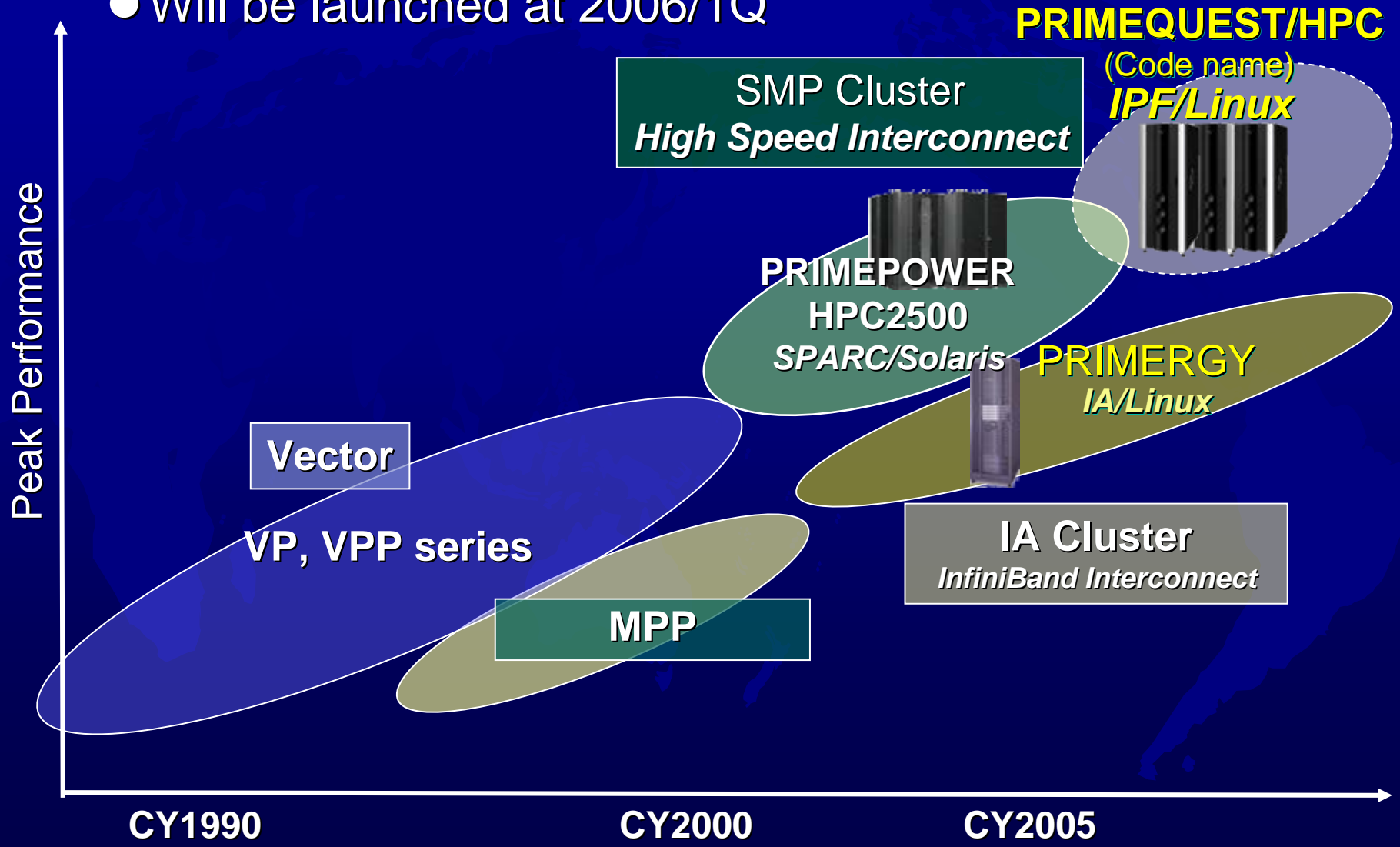


Latest Major Fujitsu's HPC Customers

User Name	Configuration
Japan Aerospace Exploration Agency (JAXA) : (~12 TFlops)	PRIMEPOWER 128CPU x 14
Japan Atomic Energy Research Institute: (~1.2 TFlops) ITBL Computer System	PRIMEPOWER 128CPU x 4 + 64CPU
Kyoto University: (~9.2 TFlops) Academic Center for Computing and Media Studies	PRIMEPOWER 128CPU x 11 + 64CPU PRIMEPOWER 128CPU (2.08GHZ cpu)
Nagoya University: (~13.5 TFlops) Information Technology Center	PRIMEPOWER(2.08GHZ) 128CPU x 2, 64cpu x 22
An Automobile Manufacturing Industry:	PRIMEPOWER IA-Cluster (Xeon) with IB IA-Cluster (Itanium2) with IB
An Electronic Industry:	IA-Cluster (Xeon) with IB IA-Cluster (Itanium2) with IB
An Electronic Industry:	PRIMEPOWER IA-Cluster (Xeon)
Institute of Physical and Chemical Research (RIKEN) : (~12.5 TFlops)	IA-Cluster (Xeon 2048CPU) with IB & Myrinet
National Institute of Informatics: NAREGI System: (~5.1 TFlops)	IA-Cluster (Xeon 256CPU) with IB PRIMEPOWER 64CPU

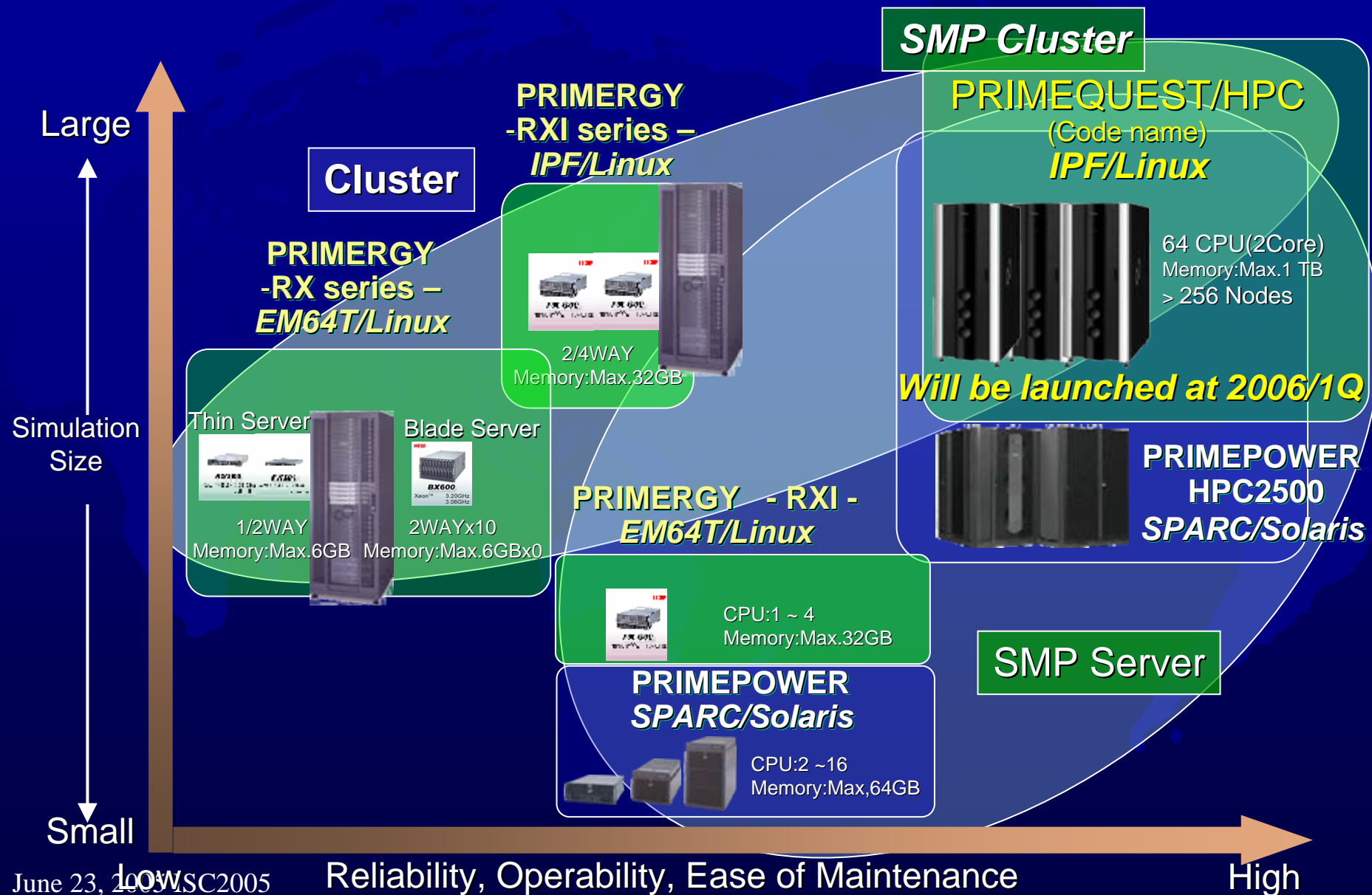
New IPF/Linux HPC Server

● Will be launched at 2006/1Q



Updated Fujitsu HPC Product Line-up

- Full range of HPC area will be covered by Linux



PRIMEQUEST/HPC (Code name)

- Will be launched at 2006/1Q -

●IPF/Linux System

- Intel's Itanium processor family : Montecito 2 cores
- Linux and HPC software environment

●True Linux SMP system

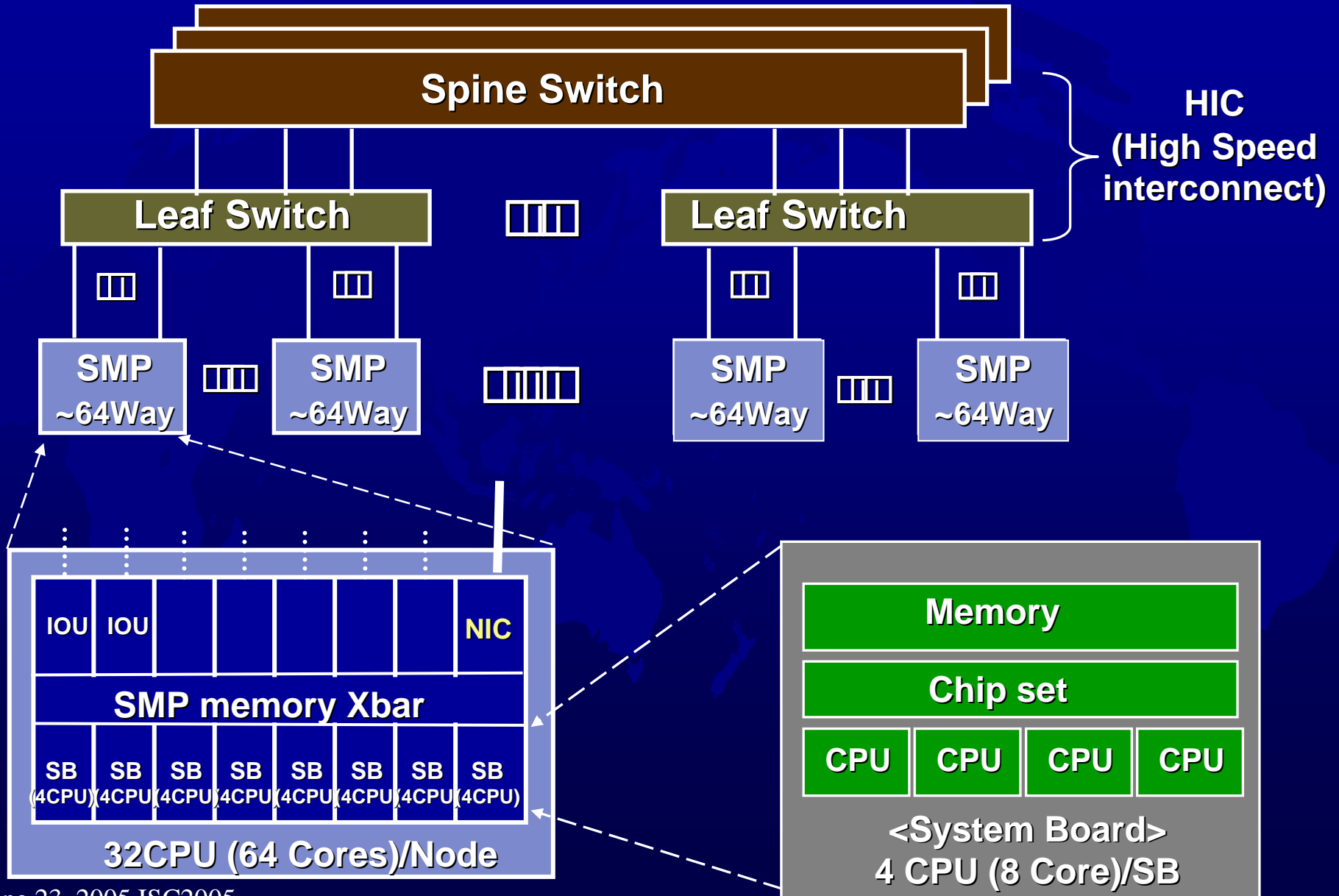
- Leveraged by Fujitsu's experiences for developing world largest SMP
 - ◆64cores, 128 threads parallel processing
 - ◆Execute very large jobs using 1TB of shared memory
 - ◆Flat memory access up to max CPUs
- Fujitsu original chip set provides enormous memory bandwidth to CPUs
 - ◆High Memory Throughput : 170GB/s Memory X-Bar

●High speed interconnect

- SMP cluster consists of more than 256 nodes



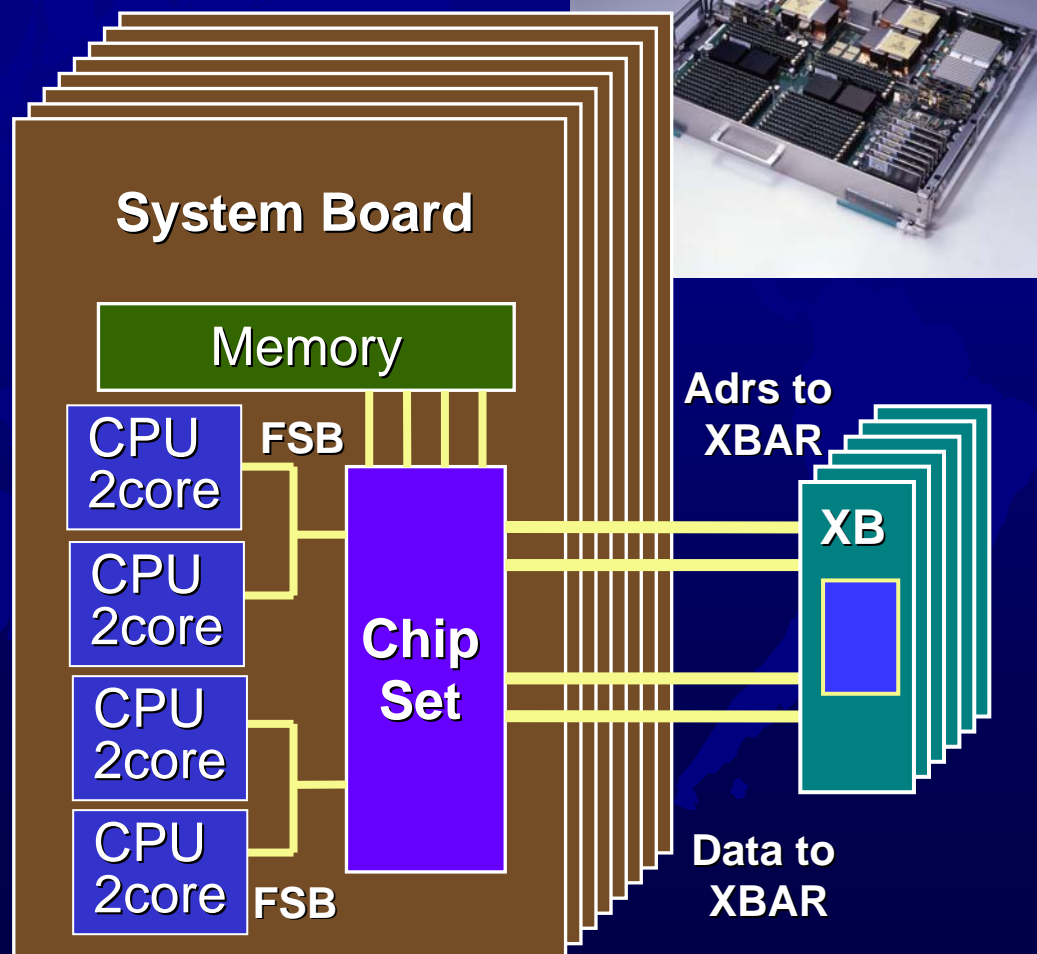
System Architecture PRIMEQUEST/HPC



System Board Architecture PRIMEQUEST/HPC

Fujitsu Original chipset achieve high memory band width and low latency

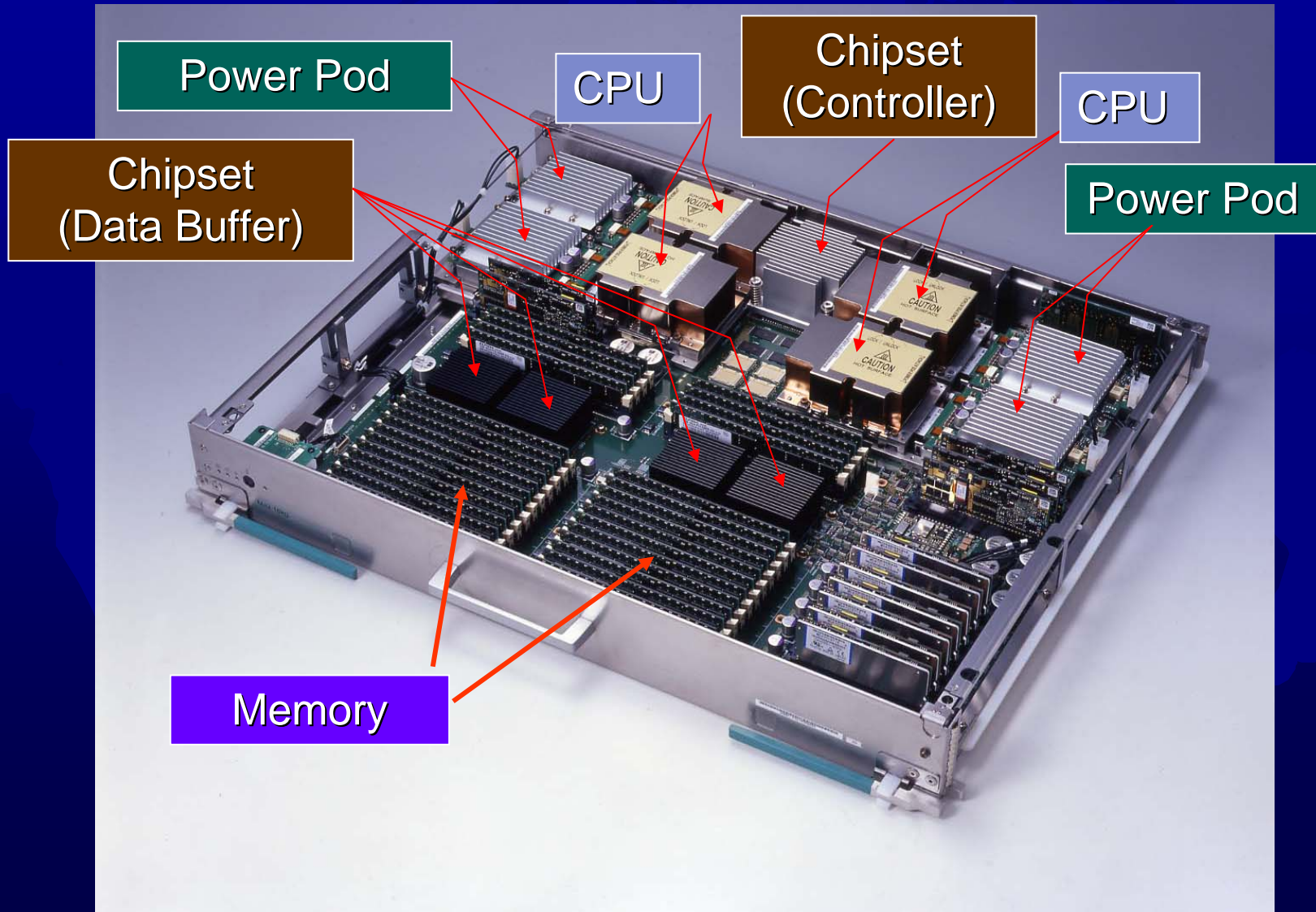
- The Latest Technology
 - 90nm CMOS, Cu 9 layer, and Low-K for chipset
- High Speed CPU Interface
- Large/High Speed SDRAM
 - 667MHz DIMM x 32/SB
- High Speed Memory Crossbar
 - @ 1.3GHz
 - 170GB/s Throughput



H/W Specification PRIMEQUEST/HPC (Planned)

CPU	Processor	Itanium®2 Montecito 2cores
	# of CPU Core/Node	8~64
Cache Memory / CPU Core		L1I:16KB, L1D:16KB L2I:1MB, L2D:256KB L3:12MB
Memory		Max. 1 TB
System Bandwidth		Max. 170GB/s
# of PCI Slot		Max. 128
Reliability	Redundant unit	Power Unit Fan-tray MMB Integrated LAN Switch, Power input Disk Mirror
	Hot-Pluggable unit	Power Unit Fan-tray MMB Disk
Size W x D x H		738 x 1100 x 1800 ~32CPU
Node	High Speed Interconnect	Max. 16 GB/s / Node
	# of Nodes	> 256 Node

System Board Photo PRIMEQUEST/HPC

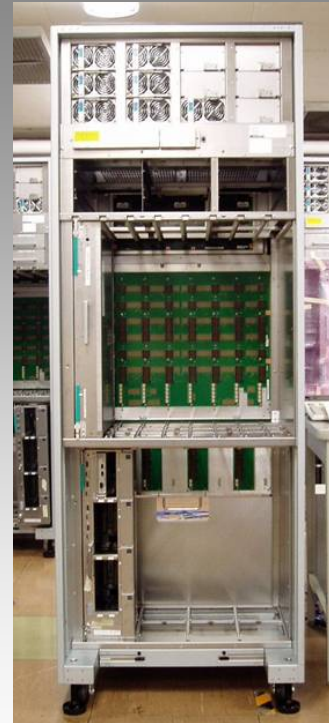


Cabinet Photo PRIMEQUEST/HPC

[Outside]



[Inside]



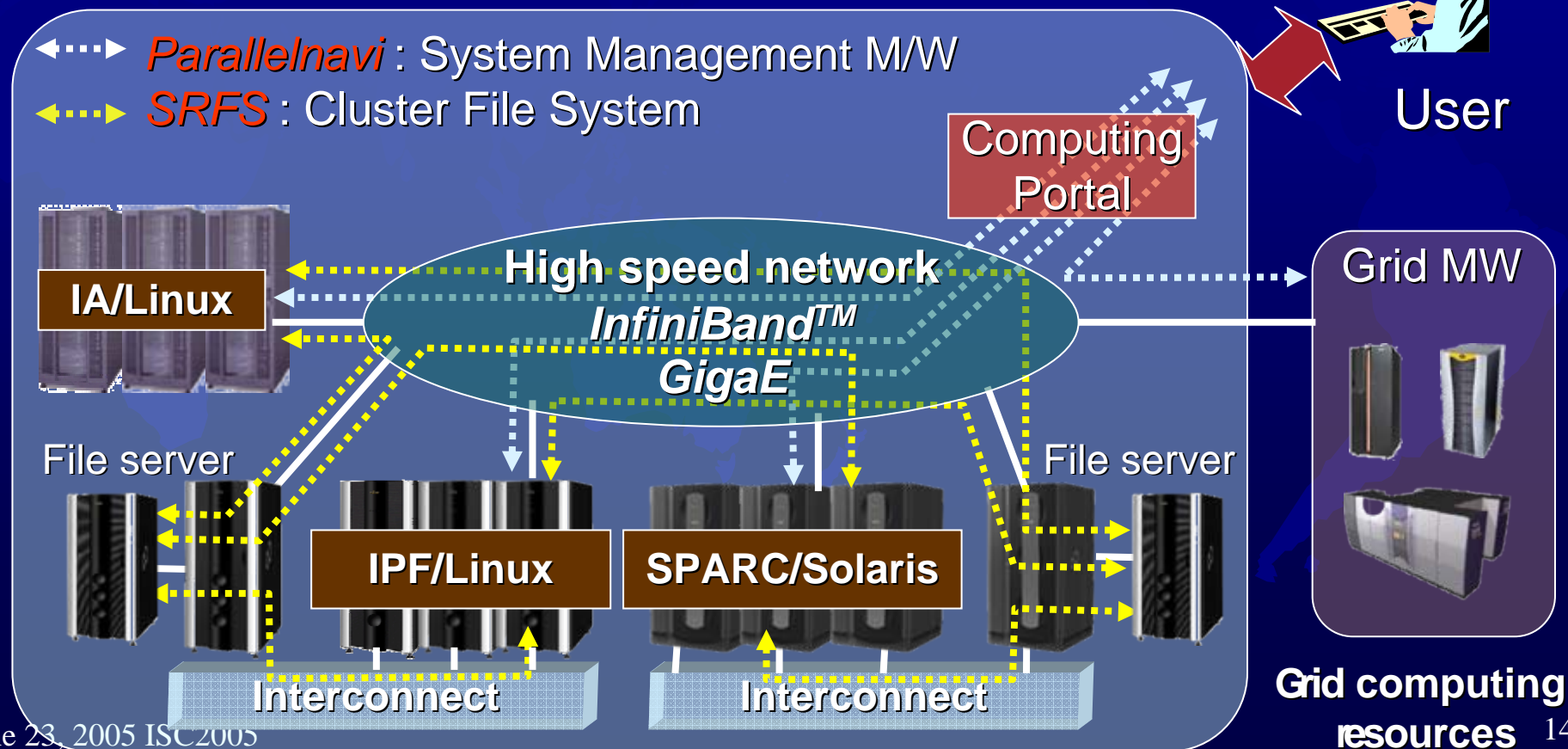
Front
Side



Back
Side

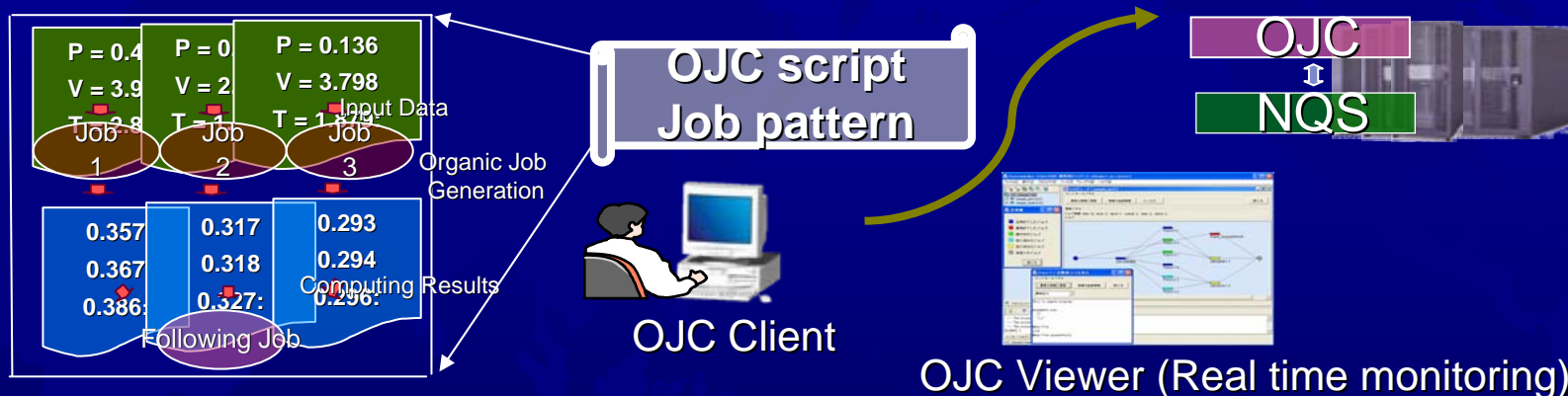
Integrated HPC Environment

- Job execution on heterogeneous platform and Grid computing resources through Computing portal
- High speed file access from heterogeneous platform with data consistency



User Friendly HPC Environment

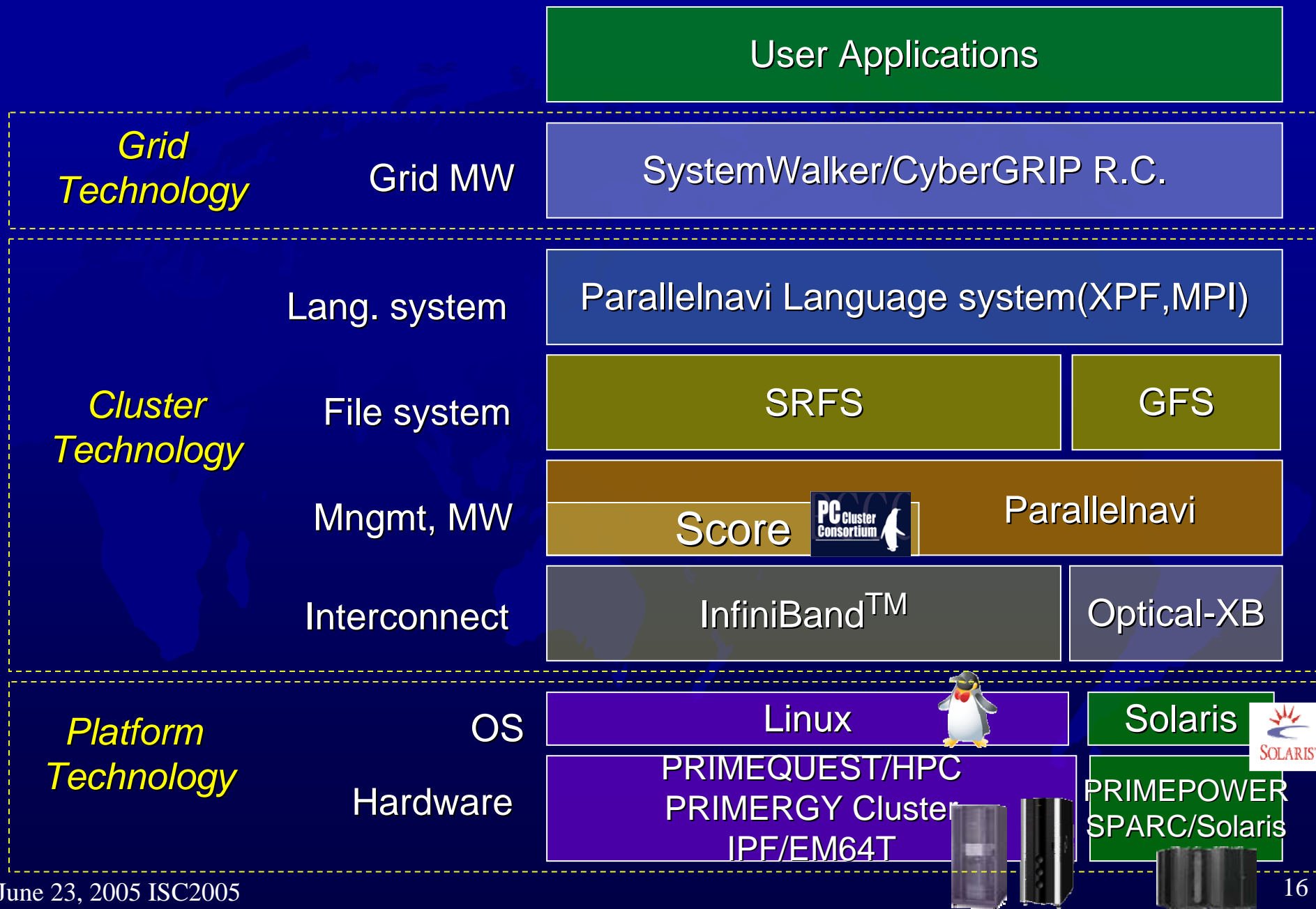
- Parallelnavi/OJC (Organic Job Controller) : Job control script and its handling tools for typical R&D job execution pattern such as **parametric job running and dynamic workflow control**



- Language system including Fujitsu's original compiler for IA/IPF architecture

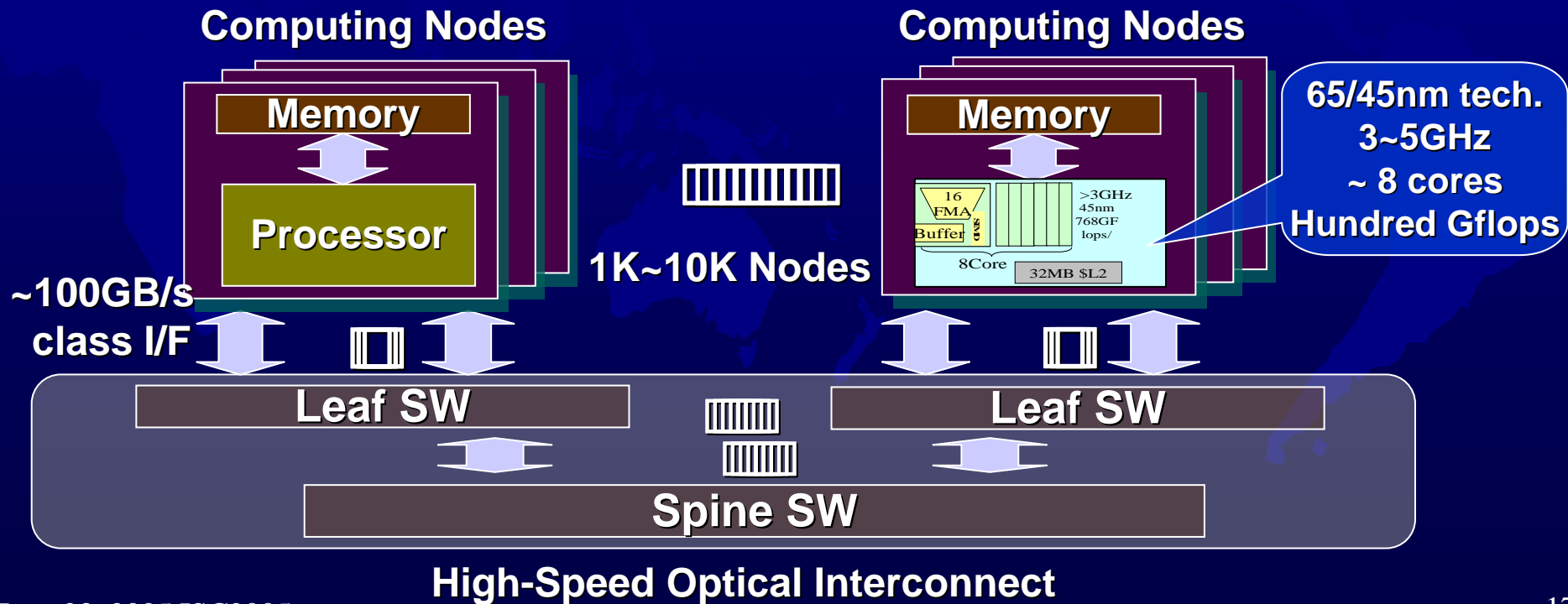
	Compiler/MPL	Tool	Math. Library
Serial	Fortran Fujitsu/Intel	Parallelnavi programming tools	SSL II, BLAS, LAPACK
	C Fujitsu/Intel		C-SSL II
	C++ Intel		SSL II BLAS, LAPACK
Data Parallel	Auto-parallel		SSL II/XPF
	OpenMP		SSL II/MPI ScaLAPACK
	XPFortran *2		
MPL	MPI		

Summary of Fujitsu's HPC Solutions



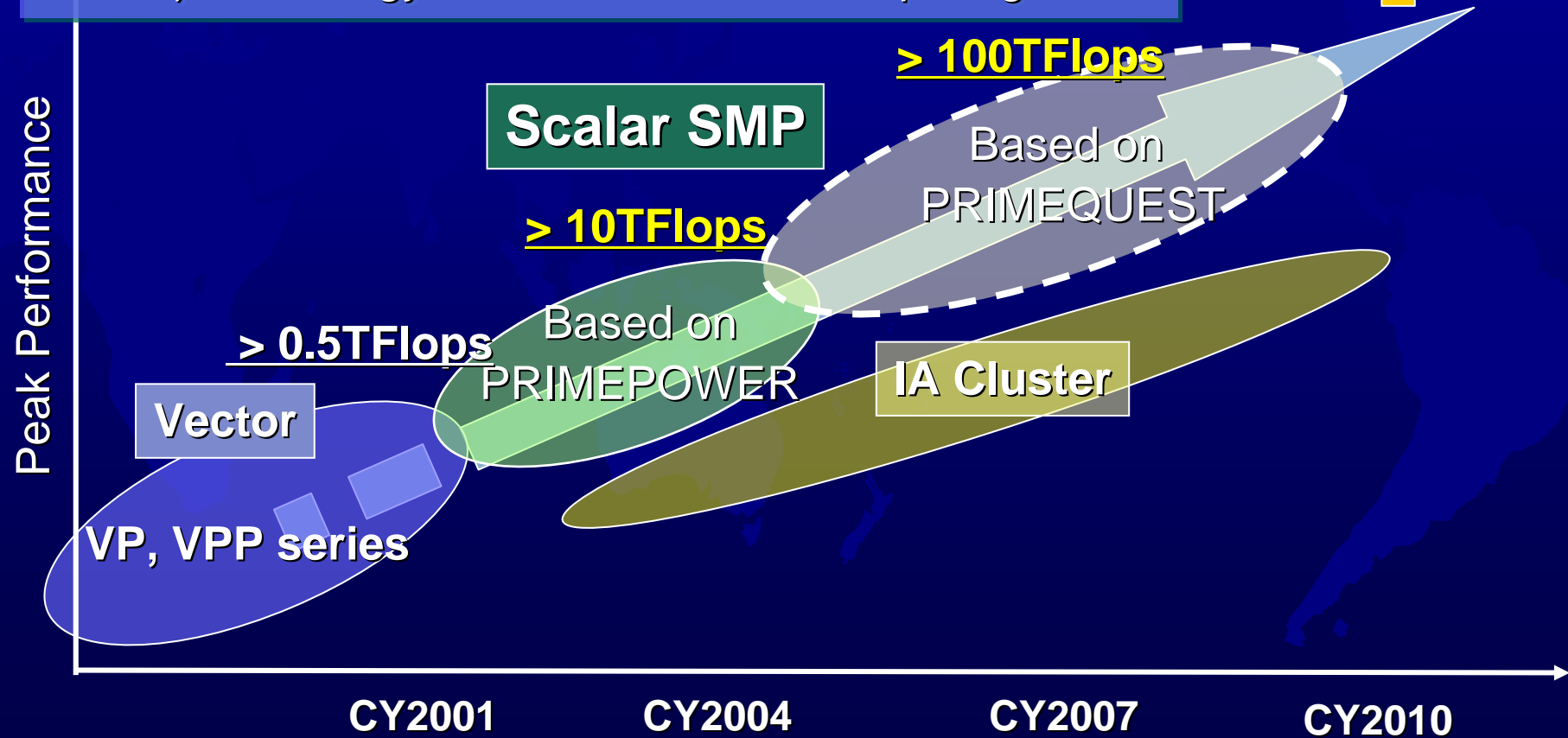
Fujitsu's Challenge to Peta-Scale Computing

- In October 2004, Fujitsu established the *Peta-Scale Computing Research Center*
- Promoting feasibility study for Peta-class system
- Engaging in 1st stage Japanese Next Generation Supercomputer project, elemental technology R&D project aiming to develop Peta-class computer in 2010, with Kyushu-Univ.



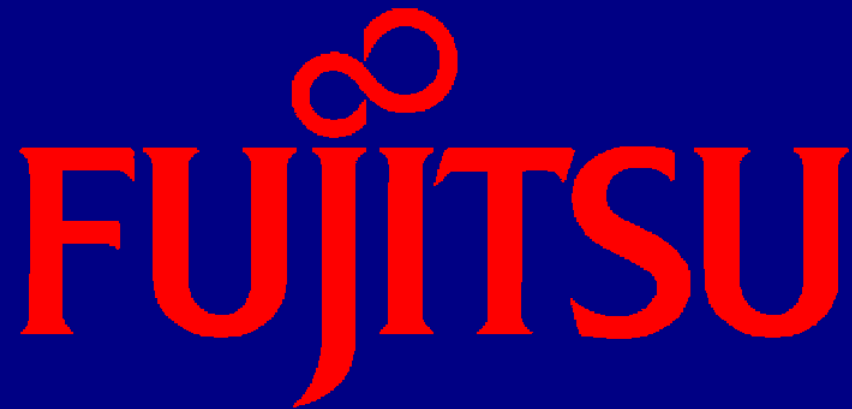
HPC Server Roadmap

- Fujitsu provides IA/Linux PRIMEQUEST/HPC as next generation >100 Tflops class HPC server
- Fujitsu challenges technology jump for x ~10 performance up from COTS (Commercial Off The Shelf) technology line to Peta-Scale computing



Conclusion

- Fujitsu continues to provide the best HPC solutions, which meets the user's various requirements.
- Fujitsu has embarked on the **Peta Scale Computing** challenge for its future HPC Product Line.



THE POSSIBILITIES ARE INFINITE